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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/812,617	03/19/2001	Jianhua Wang	OPT-101	1319

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EXAMINER

SUCHECKI, KRISTYNA

ART UNIT PAPER NUMBER

2882

DATE MAILED: 02/28/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/812,617

Applicant(s)

WANG ET AL.

Examiner

Krystyna Suchecki

Art Unit

2882

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-13 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 10 is/are allowed.
- 6) ☒ Claim(s) 1-9 and 11-13 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 19 March 2001 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on ____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. ____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 4.
- 4) ☐ Interview Summary (PTO-413) Paper No(s) ____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other:

DETAILED ACTION

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claim 8 is rejected under 35 U.S.C. 102(b) as being anticipated by Heanue (US 6,301,403).
3. Regarding Claim 8, Figure 1 of Heanue teaches an optical switch comprising:
- a. An optical input (item 41) for receiving an light beam;
 - b. A rotatable-mirror x-y scanner (items 56, 57, 61, 68) optically coupled to the optical input, for selectively directing the light beam to one of a plurality of output paths (item 16); and
 - c. An array of optical outputs (item 16) capable of optical communication with the x-y scanner and aligned over an output surface (items 31/32), each of the optical outputs being aligned with one of the output paths so as to receive the light beam when directed by the x-y scanner.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claims 1-7 and 12-13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Heanue (US 6,301,403) in view of Tiao (US 5,920,667).
6. Regarding Claims 1 and 12, Figure 1 of Heanue teaches an optical switch and switching method comprising and using:
- d. An input fiber collimator (item 47) for receiving a light beam;
 - e. A first mirror (item 68) optically connected to the input collimator, for receiving the light beam from the input collimator;
 - f. A first galvanometer (item 57) coupled to the first mirror, for rotating the first mirror around a first axis so as to position the first mirror alternatively to any one of a plurality of first mirror positions;
 - g. A second mirror (item 61) optically connected to the first mirror, for receiving the light beam from the first mirror;
 - h. A second galvanometer (item 56) coupled to the second mirror, for rotating the second mirror about a second axis perpendicular to the first axis, so as to position the second mirror alternatively to any one of a plurality of second mirror positions; and
 - i. A fiber collimator (item 32) optically coupled to the second mirror, the output collimator being aligned with a ray corresponding to one of the first mirror positions and one of the second mirror positions, whereby the light beam is directed to the output collimator by rotating the first mirror and the second mirror.
7. Heanue fails to teach a two-dimensional array of output fiber collimators each optically coupled to the second mirror, each of the output collimators being aligned with a ray corresponding to one of the first mirror positions and one of the second mirror positions,

whereby the light beam is directed to any one of the output collimators by rotating the first mirror and the second mirror.

8. Tiao teaches an optical switch with fiber collimators associated with fiber inputs and outputs (Figures 2 and 3). Tiao teaches that the use of individual fiber collimators associated with a fiber in a switch system for the purpose of creating a distinct signal "on" and "off". Only one, mutually aligned, condition will allow the input of the switch system to couple to the output end of the system (Column 3, line 30- Column 4, line 20). One of ordinary skill in the art would see the additional benefit of this alignment condition to be the reduction of channel crosstalk between fibers in an array/bundle.

9. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to use individual fiber collimators with each fiber in the system of Heanue as taught by Tiao since the creation of a distinct signal "on" and "off" condition would allow the input of the switch system to couple to the output end of the system under only one alignment situation. One of ordinary skill in the art would see a further benefit of this alignment condition to be the reduction of channel crosstalk between fibers in the system of Heanue.

10. Regarding Claims 2-7 and 13, Heanue teaches a switching system and method for switching above with a bundle/array of output fibers arranged after a collimator (Figure 1, item 16). In combination with Tiao above, a system with an array of collimators and associated fibers are taught.

11. Heanue fails to teach a system wherein an array of output collimators is arranged over an output surface having a substantially spherical or concave curvature. Heanue also fails to teach

the mathematical representations of the inter-relationships of the curvature and switch elements detailed in Claims 2-4.

12. Tiao teaches an array of output collimators arranged in a circle and further teaches that it is known in the art, especially in reflector systems, to arrange collimated fibers circularly for the benefit of maintaining a constant distance between input, reflection and output sections of the switching system in order to aid in aligning of the beam transmitted therebetween (Column 1, lines 40-63). It is implied in Tiao that certain distances must be maintained between inputs, reflectors and outputs in order for the system to work, and that establishing these distances can be done by one of ordinary skill in the art.

13. Since a circular section is simply a portion of a sphere, the combination of a circular section of fibers and collimators as taught by Tiao with an array of fibers and collimators as taught by Heanue would yield a spherically curved output surface. The representations in claims 2-4 appear to merely be mathematical representations of known relationships between reflective elements and the surface light is reflected against, and therefore would have been obvious to one of ordinary skill in the art at the time the invention was made to construct. It would have been obvious to one of ordinary skill in the art at the time the invention was made to construct a spherical array of fibers and collimators in the array system of Heanue for the benefit of maintaining a constant distance between input, reflection and output sections of the switching system in order to aid in aligning of the beam transmitted therebetween.

14. Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over Heanue in view of Geiger (US 5,299,054).

15. Regarding Claim 9, Heanue teaches an optical system comprising:
- j. An optical source (Column 3, line 27) for generating a light beam (Figure 1, item 51);
 - k. An optical switch (Figure 1, item 11) in optical communication with the optical source, for receiving and directing the light beam, the optical switch comprising:
 - i. An optical input (Figure 1, item 41) optically connected to the optical source, for receiving the light beam,
 - ii. A rotatable-mirror x-y scanner (Figure 1, items 56, 57, 61, 68) optically coupled to the optical input, for selectively directing the light beam to one of a plurality of output paths (item 16); and
 - iii. An array of optical outputs (item 16) capable of optical communication with the x-y scanner and aligned over an output surface (items 31/32), each of the optical outputs being aligned with one of the output paths so as to receive the light beam when directed by the x-y scanner;
16. Heanue fails to specifically teach that an array of optical receivers is each optically connected to a corresponding optical output, for receiving a light beam when the light is directed by the x-y scanner to a corresponding optical output.
17. Heanue instead teaches that the inventive switch (item 11) can be used in telecommunications systems, computer data storage systems, data networks and television systems (Column 10, lines 40-54). The systems and networks would benefit from the switch's small form factor and low power requirement.

18. Geiger teaches a data storage system with a fiber optic switch in Figure 10 wherein fibers are optically connected to an array of photodetectors. The “n” photodetectors are optically linked to “n” fibers and allow for distinction between fibers in a scanning system of a data storage system (Column 9, line 33- Column 10, line 11).
19. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to use an array of optical receivers, each optically connected to a corresponding optical output, for receiving a light beam when light is directed by an x-y scanner to a corresponding optical output in the system of Heanue in order to provide a switch for use in data storage systems that has a small form factor and low power requirement (Heanue, Column 10, lines 40-54) and that would also be for the purpose of allowing distinction between fibers in a scanning system of a data storage system (Geiger, Column 9, line 33- Column 10, line 11).
20. Claim 11 is rejected under 35 U.S.C. 103(a) as being unpatentable over Heanue in view of Geiger and Tiao.
21. Regarding Claim 11, Figure 1 of Heanue teaches an optical switch comprising:
- l. An optical output for directing a light beam (item 16);
 - m. A rotatable-mirror x-y scanner optically coupled to the optical output (items 56, 57, 61, 68), for selectively directing one of a plurality of received light beams to the optical output; and
 - n. An array of optical inputs (item 41) capable of optical communication with the x-y scanner, each of the optical inputs directing one of the plurality of light beams to the x-y scanner.

22. Heanue fails to specifically teach that an optical output directs light to an optical receiver.
23. Heanue instead teaches that the inventive switch (item 11) can be used in telecommunications systems, computer data storage systems, data networks and television systems (Column 10, lines 40-54). The systems and networks would benefit from the switch's small form factor and low power requirement.
24. Geiger teaches a data storage system with a fiber optic switch in Figure 10 wherein fibers are optically connected to a receiver. The "n" photodetectors of the receiver are optically linked to "n" fibers and allow for distinction between fibers in a scanning system of a data storage system (Column 9, line 33- Column 10, line 11).
25. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to use an optical output that directs light to an optical receiver in the system of Heanue in order to provide a switch for use in data storage systems that has a small form factor and low power requirement (Heanue, Column 10, lines 40-54) and that would also be for the purpose of allowing distinction between fibers in a scanning system of a data storage system (Geiger, Column 9, line 33- Column 10, line 11).
26. Heanue also fails to teach that the array of optical inputs are aligned over a concave input surface.
27. Tiao teaches an array of collimators and associated fibers arranged in a circle and further teaches that it is known in the art, especially in reflector systems, to arrange fibers along a curvature for the benefit of maintaining a constant distance between input, reflection and output sections of the switching system for the purpose of aligning of the beam transmitted therebetween (Column 1, lines 40-63).

28. Since a circular section is simply a portion of a sphere, the combination of a circular section of fibers as taught by Tiao with an array of fibers as taught by Heanue would yield a spherically curved output surface.

29. It would have been obvious to one of ordinary skill in the art at the time the invention was made to construct a spherical array of fibers in the array system of Heanue for the benefit of maintaining a constant distance between input, reflection and output sections of the switching system for the purpose of aligning of the beam transmitted therebetween (Column 1, lines 40-63).

Allowable Subject Matter

30. The following is an examiner's statement of reasons for allowance: Claim 10 contains allowable subject matter for at least the reason that the prior art fails to teach or suggest reasons for combining two x-y scanners and associated concave input and output array as set forth in the claimed combination.

31. Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."


Conclusion

32. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Patent to Landa (US 4,989,932) is noted for teaching that it is known in the art to tailor a circular receiver surface about a reflective surface for the advantage of creating short path lengths between the reflector and receiver in order to reduce misalignment between the reflector

and receive elements (Column 5, lines 37-43). Patent to Tsai (US 5,420,946) is cited by Tiao and included for your reference for teachings circular arrangements about a reflective element. Patent to Rizkin (US 5,986,792) is of interest for also teaching circularity of optical fiber and coupler arrangements in relation to a reflective element. Patent to d'Auria (US 4,229,071) is of interest for teaching a receiver matrix as a fiber array or photo-diode arrangement. Patent to Duck (US 4,378,144) is of interest for teaching a rotating switching system with collimating lenses and fibers.

33. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Krystyna Suchecki whose telephone number is (703) 305-5424. The examiner can normally be reached on M-F 8-6, with alternating Fridays off.
34. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Robert Kim can be reached on (703) 305-3492. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 872-9318 for regular communications and (703) 872-9319 for After Final communications.
35. Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 305-4900.

ks
February 20, 2003


SUPERVISOR
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